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SECTION 11
NETWORK ELEMENTS

A Network Element (NE) is any component of a network through which the Defense Switched Network (DSN) bearer and signaling traffic transits. This may include either Time Division Multiplexing (TDM) or Internet protocol (IP) bearer and signaling traffic or both. The transport between NEs may be TDM, IP, or Direct Line of Sight (DLoS). For IP transport, the IP connection may transit a Local Area Network (LAN), Metropolitan Area Network (MAN), Campus Area Network (CAN), or Wide Area Network (WAN) dependent on its deployment. It can interconnect Session Controller (SC), Multifunction Softswitch (MFSS), and Softswitch (SS) Voice and Video over IP (VVoIP) bearer and signaling traffic as well as transport all other IP traffic.

NEs using DLoS transport have no intervening bridge, relay, or switch device between the actual transport devices. An NE using DLoS transport may be comprised of a single transmitter or receiver device, or operate with a separate receiver and transmitter elements, but still operate on the whole as a single NE. Additionally, the NE using DLoS transport may have redundant transmitters or receivers to increase reliability and to meet other stated requirements. The NEs may include multiplexers, routers, Channel Servicing Unit/Data Servicing Units (CSU/DSUs), compression devices, circuit emulation, channel banks, and/or any network device that could have an effect on the performance of the associated network traffic. For DLoS transport, this would include technologies such as Free Space Optics, millimeter wave, or other radio frequency (RF) formats, proprietary or standards-based, such as IP-based protocols (e.g., the 802.11 and 802.16 series). However, an NE having an IP interface and using a DLoS transport composed of 802.11 and/or 802.16 series standards shall instead meet the requirements for a Wireless Access Bridge in Unified Capabilities Requirements (UCR) 2013, Section 7, Network Edge Infrastructure.

In terms of network arrangements, the DLoS can be used for direct Point-to-Point (P2P) Link, Point-to-MultiPoint (P2MP) Link, and/or Mesh/Semi-Mesh (M/SM) Link arrangement. A P2P Link consists of two connection endpoints with no intervening connection endpoints in between. A P2MP Link is a specific type of multipoint link providing network traffic multiple paths from a single location to multiple locations. Such a link consists of a central connection endpoint that is connected to multiple peripheral connection endpoints. Any transmission of data that originates from the central connection endpoint can be received by all of the peripheral connection endpoints, also known as multicast like, while any transmission of data that originates from any of the peripheral connection endpoints is received only by the central connection endpoint. An M/SM network arrangement implies a peer-to-peer type relationship between two or more multiple connection endpoints.

Given the three link architectures defined previously, the NEs may operate in three defined architectural configurations: P2P, P2MP, and M/SM. In P2P architecture, the two NEs have a single connection and traffic flow association; thus, the two NEs operate as a matched set only. The ingress traffic to the NE is the egress traffic of the other, and vice versa.

The P2MP and M/SM architectures behave somewhat the same; thus, they can be referred to as Point-to-Network (P2N) for NEs. In a P2N configuration, this is not the case. The P2N architecture defines all the physical route connections between the various NEs composing the P2N. The P2N Association Path (AP) defines what ingress traffic types and bandwidth amount are routed via a specific NE's route path within that P2N architecture. The ingress traffic to one of the NEs in the P2N AP may fully or partially egress one or more of the other NEs. However, the aggregate egress from all NEs in the P2N architecture must be identical to the aggregate ingress of all of the NEs in the same P2N architecture. However, if operating in a P2MP mode that is applying multicast from a central NE to the peripheral NEs, then the aggregate of the additional multicast traffic must be accounted for in the egress sum total.

A P2N architecture can be a star, full-mesh, semi-mesh, or other architecture configuration. Since P2N architectures can result in multiple serial NE hops from where the associated ingress and egress traffic enters and exits the P2N architecture, the Special Interoperability Test Certification Report will state the maximum latency for a P2N AP. This maximum AP latency will be the limiting design criteria for establishing the P2N deployment architecture.

Figure 11-1, Network Element Diagram, shows the typical P2P architecture where an NE can operate as a standalone device or integrated into the transmission interfaces of switches or other network devices. The same stand-alone or integrated capability also applies to NEs in a P2N architecture approach wherein the only difference in Figure 11-1 is that there are three or more NEs connected to the "Transport Bandwidth" interoperating. Network Elements could be anything and everything in the route or path that connects DSN switches, non-DSN switches, and/or IP devices not categorized elsewhere in this document (e.g., multiplexers, routers, CSU/DSUs, D-channel compression devices, and/or trunk encryption). The use of NEs shall not provide the means to bypass the DSN as the first choice for all switched voice and dial-up video telecommunications between Department of Defense (DoD) user locations.
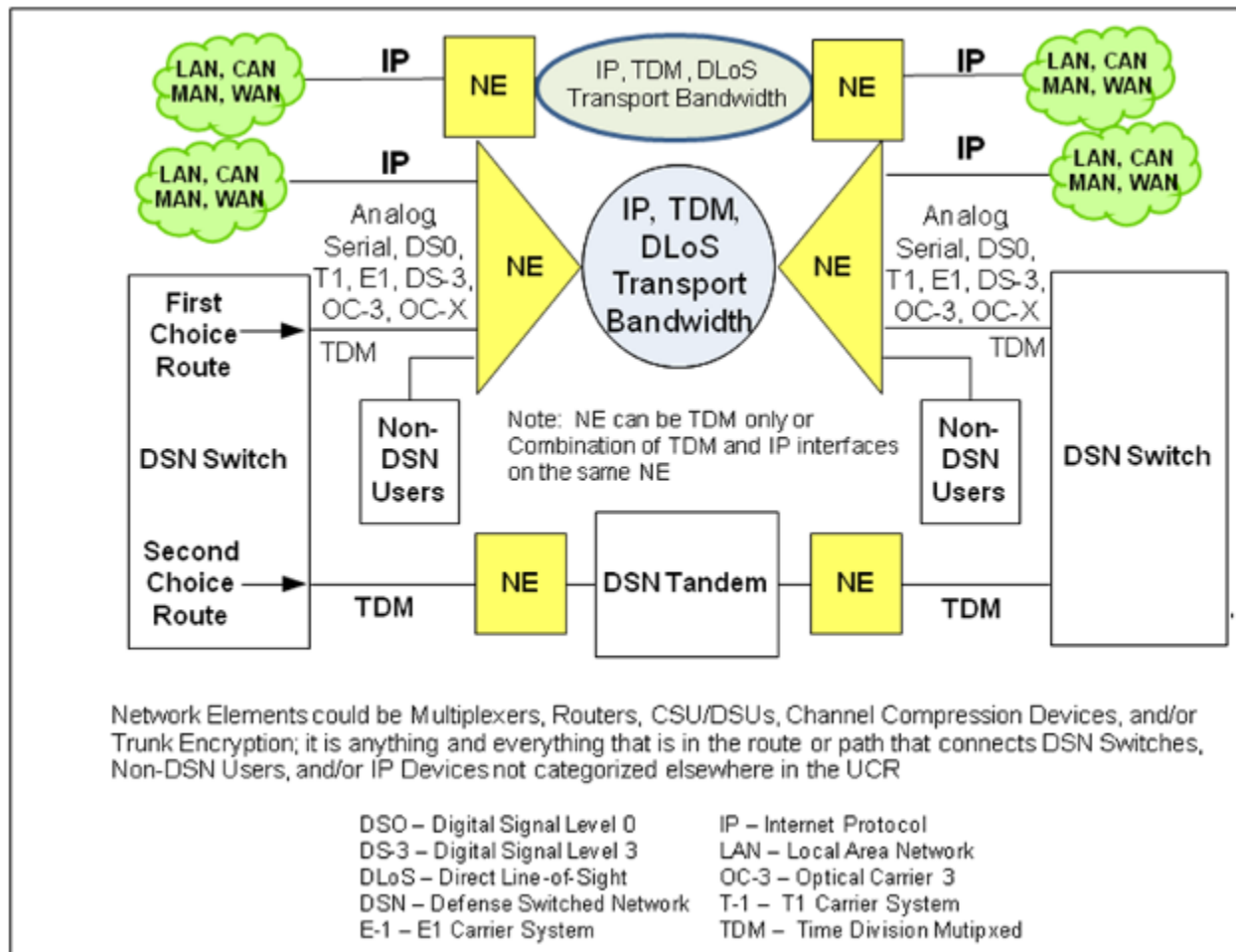
Figure 11-1.   Network Element Diagram